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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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08/902,133

07/29/1997

LEONARD FORBES

303.356US1

9876

7590

09/19/2005

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EXAMINER

WILSON, ALLAN R

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 09/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

08/902,133

Applicant(s)

FORBES ET AL.

Examiner

Allan R. Wilson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-5,8-10,12-14,18-20,28,29,32,35,36,39-71 and 73-78 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) See Continuation Sheet is/are rejected.
- 7) ☒ Claim(s) 18,39,44,46,48,50,52,54,56,58,60,62,64,66,68,70,73,74 and 78 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 0805
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Continuation of Disposition of Claims: Claims rejected are 2-5,8-10,12-14,19,20,28,29,32,35,36,40-43,45,47,49,51,53,55,57,59,61,63,65,67,69,71 and 75-77.

DETAILED ACTION

Terminal Disclaimer

The terminal disclaimer filed on 08/04/2005 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of to U.S. Patent Nos. 6031263, 5886368, and 6249020 and U.S. Patent Application Nos. 08/902,133, 09/691004 and 08/903486 has been reviewed and is accepted. The terminal disclaimer has been recorded.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2-5, 8-10, 12-14, 19, 20, 28, 29, 32, 35, 36, 40-43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65, 67, 69, 71 and 75-77 are rejected under 35 USC § 103 (a) as being unpatentable over U.S. Patent No. 5,438,211 to Nakamura et al. ("Nakamura") in view of U.S. Patent No. 5,032,883 to Wakai et al ("Wakai").

With regards to claims 2, 8-10, 12-14 19, 28, 29, 32, 35, 36, 40, 43, 45, , 51, 55, 57, 61, 63, 65, 75 and 77 Nakamura illustrates in figures 4A-7D (entire document), particularly figure 4C, a source region 118;

a drain region 117;

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a channel region 103x between the source region and the drain region;

a floating gate 120a separated from the channel region by an insulator, the floating gate comprising aluminum, which has an electron affinity of about 2.8 eV¹, that has a smaller electron affinity than polycrystalline silicon and a barrier energy between the floating gate and the insulator being less than approximately 2.0 eV (2.8-2.1=0.7, using Si₃N₄)²;

a control electrode 120b, separated from the floating gate by an intergate dielectric 114 (FIG. 5A).

Nakamura does not show a intergate dielectric has a permittivity that is higher than a permittivity of silicon dioxide. Wakai teaches that it is known in the art to form a transistor in which a SiC active layer is separated from its gate electrode by either silicon dioxide layer or a silicon nitride layer (col. 5, lines 45-62). The use of silicon nitride in place of silicon dioxide is considered a substitution of an equivalent material and for that reason is not patentable.

Claims 3-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Nakamura. Though Nakamura taught the device and method of operating the device of claims 28, 29, 32, Nakamura did not specifically teach the claimed operating parameters such as write/erase times, charge retention times or detected signal strength. However, these limitations are considered either inherent in the device/method of Nakamura or obvious there over. The limitations are considered inherent because they are dependent on the materials/barrier energy for the floating

¹ The value for electron affinity of aluminum is based on "UPS of Negative Aluminum Clusters" by Taylor et al. *Chemical Physics Letters*, Vol. 152, no. 4.5, 18 Nov. 1988.

² The value for electron affinity of Si₃N₄ is from US Patent Application Publication No. 2004/0004247 to Forbes et al. FIG. 6.

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gate and insulator. Because Nakamura teaches the material properties as instantly taught by applicant and thus achieves a device having the claimed barrier energy, the claimed operating parameters, which are dependent on the barrier energy, are considered inherent. Alternately, the claimed operating parameters are considered merely optimization of that which is known in the art. Faster operation of a device by means of e.g. write/erase times achieves quicker and thus improved performance. As such, the limitations are considered obvious.

With regards to claims 41, 42, 47, 49, 53, 59, 69 and 76, Nakamura illustrates in FIG. 4B an area of a capacitor formed by the control electrode 120b, the floating gate 120a, and the intergate dielectric 114 is larger than an area of a capacitor formed by the floating gate, the insulator, and the channel region 103x.

With regards to claim 67, it is well known in the art to provide a plurality of memory cells for a memory device.

With regards to claims 71 and 76, it is well known in the art to provide a row decoder; a column decoder; a command and control circuit; a voltage control circuit; and wherein the memory cells are arranged in an array for a memory device.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Allowable Subject Matter

Claims 18, 39, 44, 46, 48, 50, 52, 54, 56, 58, 60, 62, 64, 66, 68, 70, 73, 74 and 78 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from an examiner should be directed to Primary Examiner Allan Wilson whose telephone number is (571) 272-1738. Examiner Wilson can normally be reached 7:00-4:00 Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (571) 272-1664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Allan R. Wilson
Primary Examiner
15 September 2005